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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/621,981	07/16/2003	Thomas E. Strangman	H0004569	2163

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Honeywell International, Inc.  
Law Dept. AB2  
P.O. Box 2245  
Morristown, NJ 07962-9806

EXAMINER

IVEY, ELIZABETH D

ART UNIT	PAPER NUMBER
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1775

DATE MAILED: 05/26/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

**Office Action Summary**

Application No.

10/621,981

Applicant(s)

STRANGMAN, THOMAS E.

Examiner

Elizabeth Ivey

Art Unit

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 17 March 2006.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-12, 14 and 17-31 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-12, 14 and 17-31 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)  | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                                   | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____  |

## DETAILED ACTION

### *Claim Rejections - 35 USC § 103*

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

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Claims 1-9, 11-12, 14, 17-21, 23-25 and 28-31 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent 6,92,4040 to Maloney et al. in view of U.S. Patent 6,733,908 B1 to Lee et al., further in view of U.S. Patent Application Publication 2005/0064213 to Subramanian et al or U.S. Patent 6,103,386 to Raybould et al. or U.S. Patent 6,103,386 to Strangeman et al.

Regarding claims 1-5, 7-9, 11-12, 14, 17-18, 20, 23-25, 29 and 31, Maloney discloses a superalloy turbine component substrate with a thermal barrier coating including a bond coat and a columnar (segmented) cubic hafnia ceramic coat, which may include yttria. (abstract, column 2 lines 8-16 and column 5 lines 12-18 and 40-67). Maloney also discloses a yttria stabilized zirconia layer may be between the bond coat and the hafnia layer (column 5 lines 45-52). Maloney does not expressly disclose a compositional gradient between the zirconia and hafnia layers but Lee discloses thermal barrier coating of zirconia and hafnia layers with a decreasing concentration of hafnia and an increasing concentration of zirconia toward the zirconia layer. Lee discloses a compositional gradient between the layers is beneficial to better match the thermal expansion coefficients between the materials (thereby preventing cracking) (column 7 lines 51-67). Therefore, it would have been obvious to a person having ordinary skill in the art at the time of the invention to employ a compositional gradient as in Lee in the coating of Maloney to better match or transition the thermal expansion coefficients of the layers. Maloney also does not disclose a stabilizing material disposed between the columns, but Subramanian, Raybould and Strangman each disclose a sintering or bond inhibitor such as yttrium aluminum oxide within the gaps between the columns of a hafnia layer. Use of these bond or sintering inhibitors

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prevents spallation and cracking of the coatings during use. Therefore, it would have been obvious to a person having ordinary skill in the art at the time of the invention to apply the a bond or sintering inhibitor as disclosed by Subramanian, Raybould or Strangman to the layering of Maloney to prevent spallation and cracking of the coating during use. Claims 3-4 are product by process claim wherein the patentability of the product does not depend on its method of production. "If the product in the product by process claim is the same as or obvious from a product of the prior art, the claim is unpatentable even though the prior product was made by a different process unless it can be shown that the product produced by the process is in some manner measurably distinct from the product produced by another process." *See MPEP 2113*. As such, the process limitations within claims 3-4 do not provide patentable distinction over the prior art. Regarding a sealant layer, Maloney discloses an additional layer (22), which may be ceramic and is applied to the surface of the thermal barrier coating. The sealant layer may reduce oxygen diffusion, and provide erosion and abrasion resistance.

Regarding claims 6 and 19, although Maloney, Lee and Subramanian, Raybould or Strangman do not expressly disclose the solubility of the stabilized hafnia layer, a chemical composition and its properties are inseparable. In re Spada, 911 F.2d 705, 709, 15 USPQ2d 1655, 1658 MPEP 2112.01. Because the prior art exemplifies the applicant's claimed composition in relation to the hafnia layer, the claimed physical property relating to the solubility is inherently present in the prior art. Absent an objective evidentiary showing to the contrary, the

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addition of the claimed physical property to the claim language fails to provide patentable distinction over the prior art.

Regarding claims 21 and 28, Maloney does not disclose the thickness of the hafnia layer. However, it would have been obvious to one having ordinary skill in the art at the time of the invention to adjust the thickness for the intended application, since it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art. In re Boesch, 617 F.2d 272, 205 USPQ 215 (CCPA 1980).

Regarding claim 30, although Subramanian Raybould and Strangeman do not disclose the particle size of the structure stabilizing material it would have been obvious to one having ordinary skill in the art at the time of the invention to adjust the particle size for the intended application, since it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art. In re Boesch, 617 F.2d 272, 205 USPQ 215 (CCPA 1980).

Claims 10, 22, 26 and 27 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent 6,92,4040 to Maloney et al. in view of U.S. Patent 6,733,908 B1 to Lee et al., further in view of U.S. Patent Application Publication 2005/0064213 to Subramanian et al or U.S. Patent 6,103,386 to Raybould et al. or U.S. Patent 6,395,343 to Strangeman further in view of U.S. Patent 4,916022 to Solfest et al.

Regarding claims 10, 26 and 27, Maloney, Lee and Subramanian or Raybould or Strangeman disclose all of the limitations of claims 1 and 23 but do not disclose a sealant layer comprising hafnia. Solfest discloses a hafnia thermal barrier and discloses an outer layer (17), which is hafnia densified or doped with titania. This layer serves to improve resistance to erosion and molten salt deposits. It would have been obvious to a person having ordinary skill in the art at the time of the invention to apply the sealant of Solfest to the thermal barrier layer of Maloney to provide improved erosion resistance.

Regarding claim 22, Maloney discloses a substrate with a thermal barrier coating including a bond coat and a columnar (segmented) cubic hafnia ceramic coat, which may include yttria. (abstract, column 2 lines 8-16 and column 5 lines 12-18 and 40-67). Maloney does not disclose the thickness of the hafnia layer. However, it would have been obvious to one having ordinary skill in the art at the time of the invention to adjust the thickness for the intended application, since it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art. In re Boesch, 617 F.2d 272, 205 USPQ 215 (CCPA 1980). Maloney also discloses a yttria stabilized zirconia layer may be between the bond coat and the hafnia layer (column 5 lines 45-52). Maloney does not expressly disclose a compositional gradient between the zirconia and hafnia layers but Lee discloses thermal barrier coating of zirconia and hafnia layers with a decreasing concentration of hafnia and an increasing concentration of zirconia toward the zirconia layer. Lee discloses a compositional gradient between the layers is beneficial to better match the thermal expansion coefficients between the materials (thereby preventing cracking) (column 7 lines 51-67). Therefore, it would have been

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obvious to a person having ordinary skill in the art at the time of the invention to employ a compositional gradient as in Lee in the coating of Maloney to increase hot corrosion resistance and thermal barrier coating temperature stability or to better match or transition the thermal expansion coefficients of the layers. Maloney also does not disclose a stabilizing material disposed between the columns, but Subramanian, Raybould and Strangman disclose a sintering or bond inhibitor such as yttrium aluminum oxide (Subramanian page 4 paragraph [0039]) in the gaps between the columns of a hafnia layer. Use of these bond or sintering inhibitors prevents spallation and cracking of the coatings during use. Therefore, it would have been obvious to a person having ordinary skill in the art at the time of the invention to apply the a bond or sintering inhibitor as disclosed by Subramanian, Raybould or Strangman to the layering of Maloney to prevent spallation and cracking of the coating during use. Claims 3-4 are product by process claim wherein the patentability of the product does not depend on its method of production. "If the product in the product by process claim is the same as or obvious from a product of the prior art, the claim is unpatentable even though the prior product was made by a different process unless it can be shown that the product produced by the process is in some manner measurably distinct from the product produced by another process." *See MPEP 2113*. As such, the process limitations within claims 3-4 do not provide patentable distinction over the prior art. Regarding a sealant layer, Maloney discloses an additional layer (22), which may be ceramic and is applied to the surface of the thermal barrier coating. The sealant layer may reduce oxygen diffusion, and provide erosion and abrasion resistance. Maloney does not disclose a sealant layer comprising hafnia. Solfest discloses a hafnia thermal barrier and discloses an outer layer (17), which is hafnia densified or doped with titania. This layer serves to improve resistance to erosion and



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molton salt deposits. It would have been obvious to a person having ordinary skill in the art at the time of the invention to apply the sealant of solfest to the thermal barrier layer of Maloney to provide improved erosion resistance.

Claims 1-9, 11-12, 14, 17-21, 23-25 and 28-31 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent 6,92,4040 to Maloney et al. in view of U.S. Patent 6,106,959 to Vance et al, further in view of U.S. Patent Application Publication 2005/0064213 to Subramanian et al. or U.S. Patent 6,103,386 to Raybould et al. or U.S. Patent 6,103,386 to Strangeman et al.

Regarding claims 1-5, 7-9, 11-12, 14, 17-18, 20, 23-25, 29 and 31, Maloney discloses a superalloy turbine component substrate with a thermal barrier coating including a bond coat and a columnar (segmented) cubic hafnia ceramic coat, which may include yttria. (abstract, column 2 lines 8-16 and column 5 lines 12-18 and 40-67). Maloney also discloses a yttria stabilized zirconia layer may be between the bond coat and the hafnia layer (column 5 lines 45-52). Maloney does not expressly disclose a compositional gradient between the zirconia and hafnia layers but Vance discloses multilayer ceramic thermal barrier coating systems with a graded

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composition between ceramic coatings Vance discloses a gradient to increase hot corrosion resistance and thermal barrier coating temperature stability. Therefore, it would have been obvious to a person having ordinary skill in the art at the time of the invention to employ a compositional gradient as in Vance in the coating of Maloney to increase hot corrosion resistance and thermal barrier coating temperature stability. Maloney also does not disclose a stabilizing material disposed between the columns, but Subramanian, Raybould and Strangman disclose a sintering or bond inhibitor within the gaps between the columns of a hafnia layer. Use of these bond or sintering inhibitors prevents spallation and cracking of the coatings during use.

Therefore, it would have been obvious to a person having ordinary skill in the art at the time of the invention to apply the a bond or sintering inhibitor as disclosed by Subramanian, Raybould or Strangman to the layering of Maloney to prevent spallation and cracking of the coating during use. Claims 3-4 are product by process claim wherein the patentability of the product does not depend on its method of production. "If the product in the product by process claim is the same as or obvious from a product of the prior art, the claim is unpatentable even though the prior product was made by a different process unless it can be shown that the product produced by the process is in some manner measurably distinct from the product produced by another process."

*See MPEP 2113.* As such, the process limitations within claims 3-4 do not provide patentable distinction over the prior art. Regarding a sealant layer, Maloney discloses an additional layer (22), which may be ceramic and is applied to the surface of the thermal barrier coating. The sealant layer may reduce oxygen diffusion, and provide erosion and abrasion resistance.

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Regarding claims 6 and 19, although Maloney, Vance and Subramanian, Raybould or Strangman do not expressly disclose the solubility of the stabilized hafnia layer, a chemical composition and its properties are inseparable. In re Spada, 911 F.2d 705, 709, 15 USPQ2d 1655, 1658 MPEP 2112.01. Because the prior art exemplifies the applicant's claimed composition in relation to the hafnia layer, the claimed physical property relating to the solubility is inherently present in the prior art. Absent an objective evidentiary showing to the contrary, the addition of the claimed physical property to the claim language fails to provide patentable distinction over the prior art.

Regarding claims 21 and 28, Maloney does not disclose the thickness of the hafnia layer. However, it would have been obvious to one having ordinary skill in the art at the time of the invention to adjust the thickness for the intended application, since it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art. In re Boesch, 617 F.2d 272, 205 USPQ 215 (CCPA 1980).

Regarding claim 30, although Subramanian, Raybould and Strangeman do not disclose the particle size of the structure stabilizing material it would have been obvious to one having ordinary skill in the art at the time of the invention to adjust the particle size for the intended application, since it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art. In re Boesch, 617 F.2d 272, 205 USPQ 215 (CCPA 1980).

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Regarding claims 10, 26 and 27, Maloney, Vance and Subramanian or Raybould or Strangeman disclose all of the limitations of claims 1 and 23 but do not disclose a sealant layer comprising hafnia. Solfest discloses a hafnia thermal barrier and discloses an outer layer (17), which is hafnia densified or doped with titania. This layer serves to improve resistance to erosion and molton salt deposits. It would have been obvious to a person having ordinary skill in the art at the time of the invention to apply the sealant of Solfest to the thermal barrier layer of Maloney to provide improved erosion resistance.

Regarding claim 22, Maloney discloses a substrate with a thermal barrier coating including a bond coat and a columnar (segmented) cubic hafnia ceramic coat, which may include yttria. (abstract, column 2 lines 8-16 and column 5 lines 12-18 and 40-67). Maloney does not disclose the thickness of the hafnia layer. However, it would have been obvious to one having ordinary skill in the art at the time of the invention to adjust the thickness for the intended application, since it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art. In re Boesch, 617 F.2d 272, 205 USPQ 215 (CCPA 1980). Maloney also discloses a yttria stabilized zirconia layer may be between the bond coat and the hafnia layer (column 5 lines 45-52). Maloney does not expressly disclose a

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compositional gradient between the zirconia and hafnia layers but Vance discloses multilayer ceramic thermal barrier coating systems with a graded composition between ceramic coatings. Vance discloses a gradient to increase hot corrosion resistance and thermal barrier coating temperature stability. Therefore, it would have been obvious to a person having ordinary skill in the art at the time of the invention to employ a compositional gradient as in Vance in the coating of Maloney to increase hot corrosion resistance and thermal barrier coating temperature stability. Maloney also does not disclose a stabilizing material disposed between the columns, but Subramanian, Raybould and Strangman disclose a sintering or bond inhibitor such as yttrium aluminum oxide (Subramanian page 4 paragraph [0039]) in the gaps between the columns of a hafnia layer. Use of these bond or sintering inhibitors prevents spallation and cracking of the coatings during use. Therefore, it would have been obvious to a person having ordinary skill in the art at the time of the invention to apply the a bond or sintering inhibitor as disclosed by Subramanian, Raybould or Strangman to the layering of Maloney to prevent spallation and cracking of the coating during use. Claims 3-4 are product by process claim wherein the patentability of the product does not depend on its method of production. "If the product in the product by process claim is the same as or obvious from a product of the prior art, the claim is unpatentable even though the prior product was made by a different process unless it can be shown that the product produced by the process is in some manner measurably distinct from the product produced by another process." *See MPEP 2113*. As such, the process limitations within claims 3-4 do not provide patentable distinction over the prior art. Regarding a sealant layer, Maloney discloses an additional layer (22), which may be ceramic and is applied to the surface of the thermal barrier coating. The sealant layer may reduce oxygen diffusion, and provide

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erosion and abrasion resistance. Maloney does not disclose a sealant layer comprising hafnia. Solfest discloses a hafnia thermal barrier and discloses an outer layer (17), which is hafnia densified or doped with titania. This layer serves to improve resistance to erosion and molten salt deposits. It would have been obvious to a person having ordinary skill in the art at the time of the invention to apply the sealant of solfest to the thermal barrier layer of Maloney to provide improved erosion resistance.

### *Response to Arguments*

Examiner acknowledges applicant's amendment to claims 1, 17, 22, 23, 29 and cancellation of claims 13, 15-16 and 32-46.

Examiner withdraws 112 rejections.

Applicant's arguments with respect to claims 1-12, 14 and 17-31 have been considered but are moot in view of the new ground(s) of rejection.

Regarding applicant's assertion that it would not be obvious to apply the yttrium aluminum oxide to both columnar layers, examiner holds that it because it is known to apply a sintering or bond inhibitor to columnar layers, it would have been obvious to apply it to both layers after deposition.

Regarding applicant's assertion that the top ceramic layer is not disclosed as thinner than the bottom ceramic layer, it would have been obvious to a person having ordinary skill in the art

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at the time of the invention to adjust the thickness for the intended application, since it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art. In re Boesch, 617 F.2d 272, 205 USPQ 215 (CCPA 1980).

### ***Conclusion***

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Elizabeth Ivey whose telephone number is (571) 272-8432. The examiner can normally be reached on 7:00- 4:30 M-Th and 7:00-3:30 alt. Fridays.

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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jennifer McNeil can be reached on (571) 272-1540. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



Elizabeth D. Ivey



JENNIFER C. MCNEIL  
SUPERVISORY PATENT EXAMINER

5/24/06